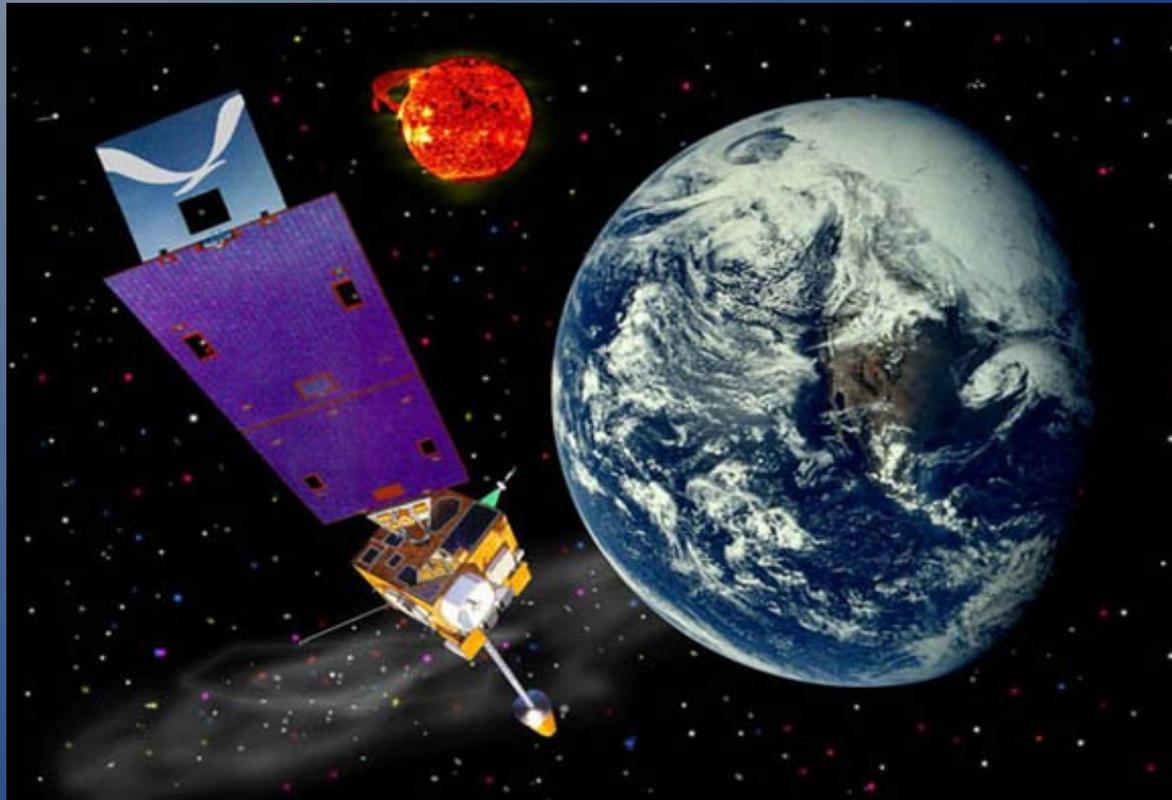


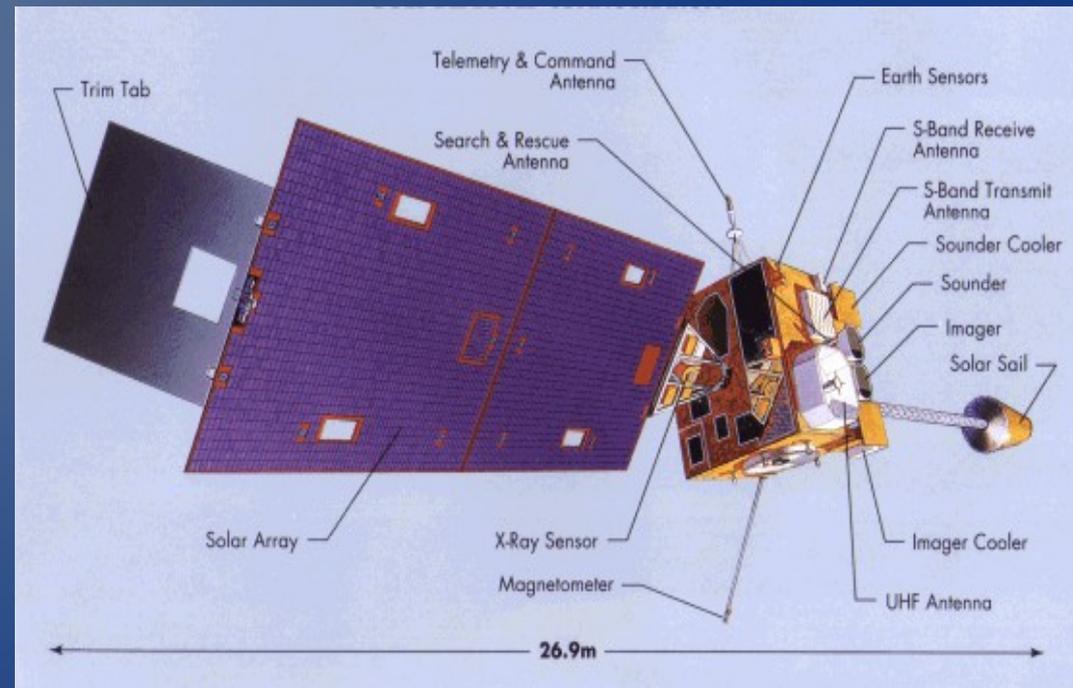
Thermal Properties of Solar Flares Over Three Solar Cycles Using GOES X-ray Observations



Daniel Ryan
April 12, 2011
Trinity College Dublin

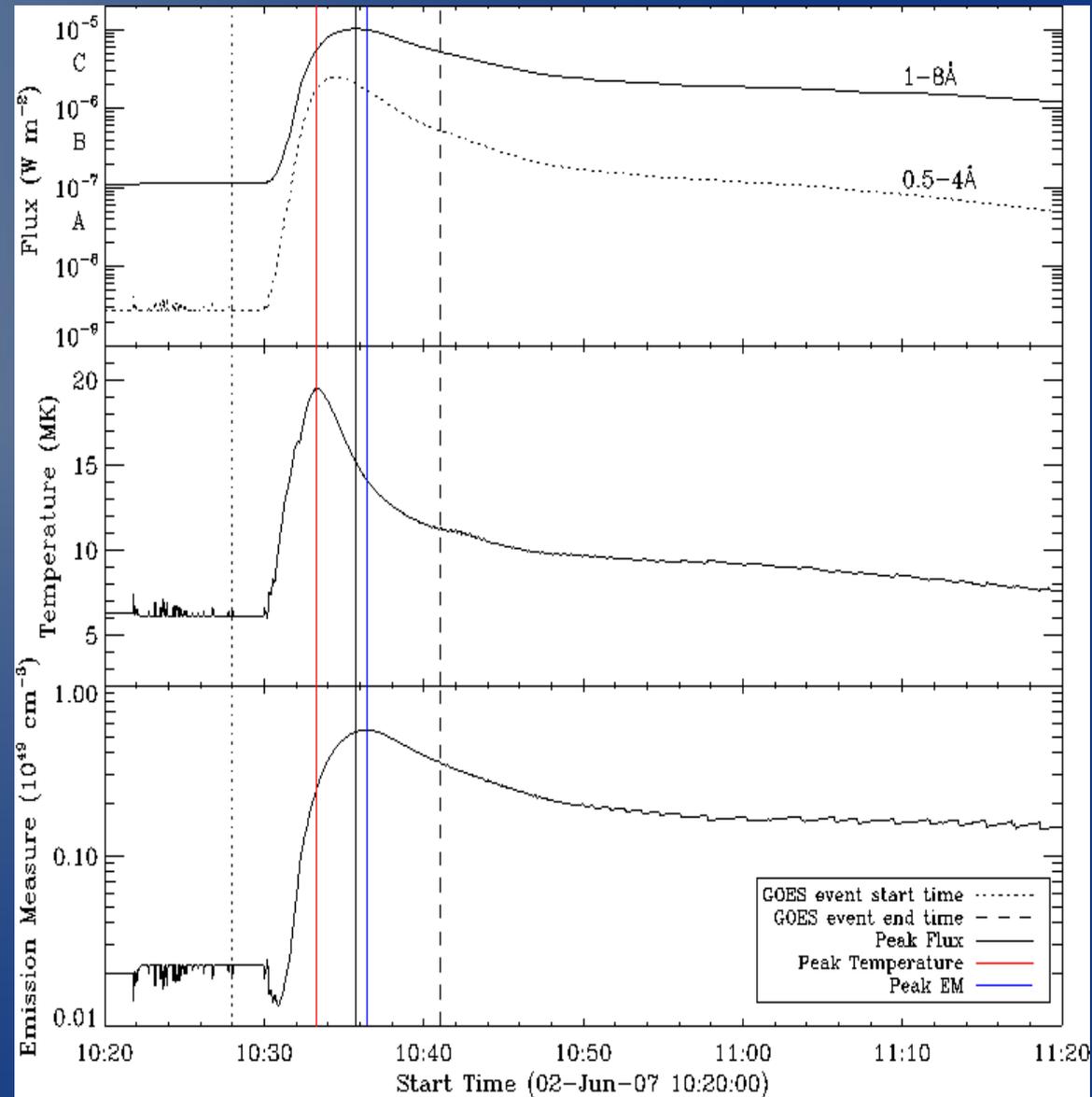
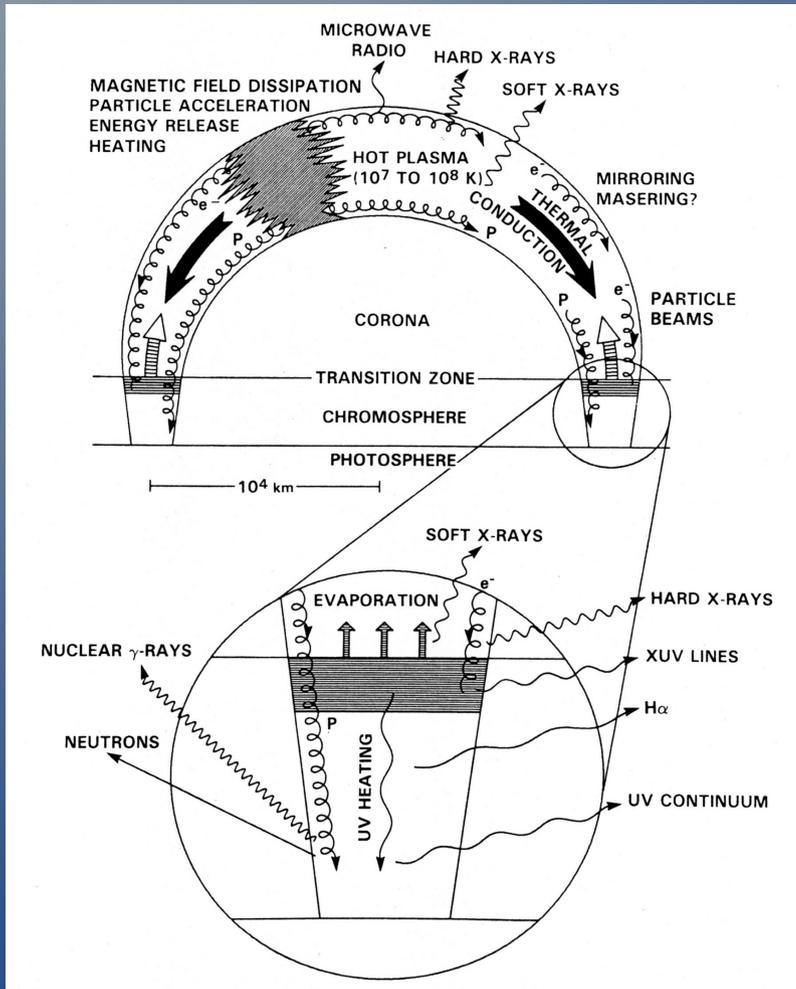
Geostationary Operational Environmental Satellite (GOES)

- Series of 15 satellites (currently)
- X-Ray Sensor (XRS) records full disk integrated solar X-rays every 3s in two passbands: 1-8 Å (Long); 0.5-4 Å (Short)
- No spatial information from XRS.
- Continuous solar X-ray coverage from 1975 to present.

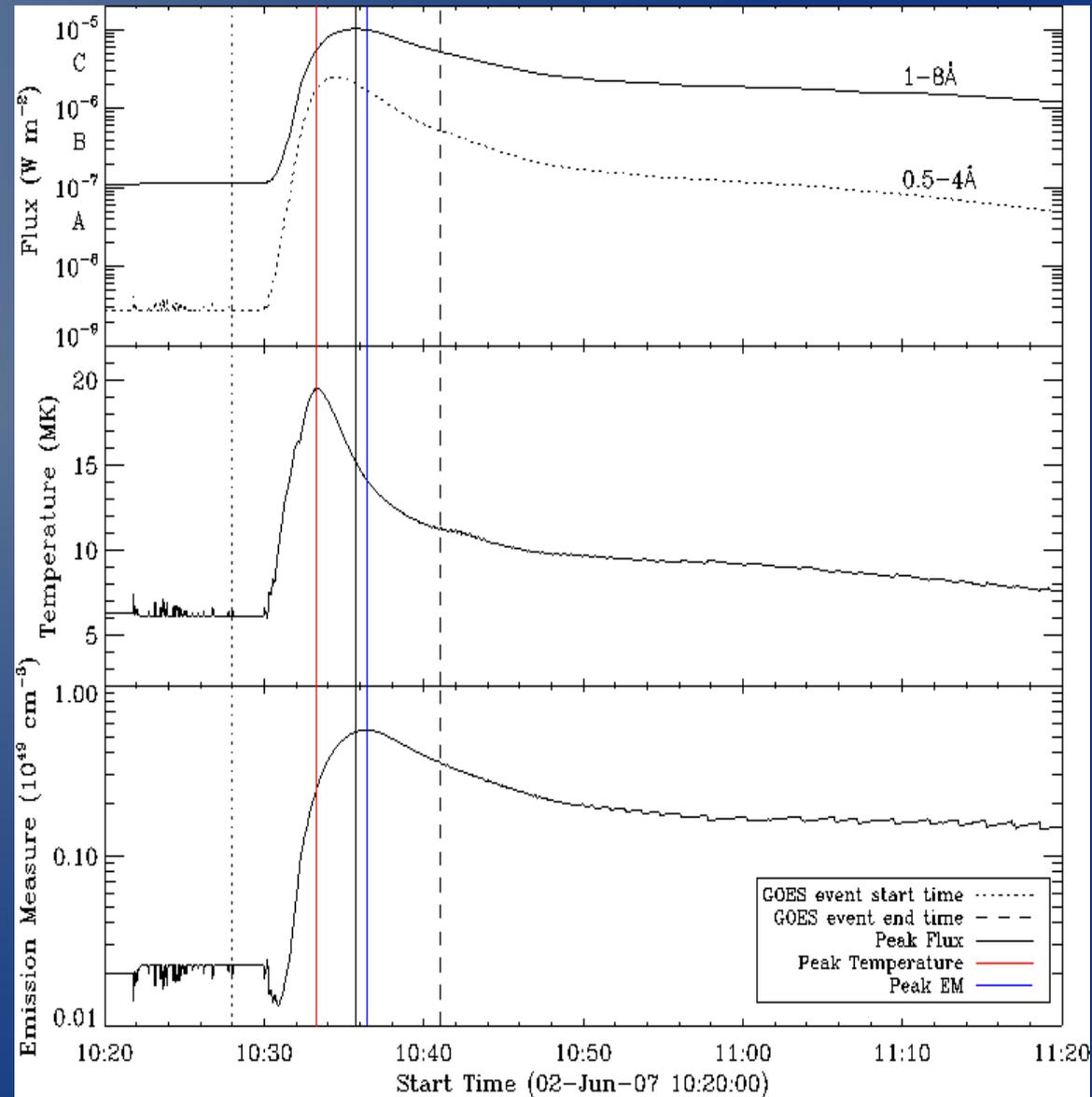
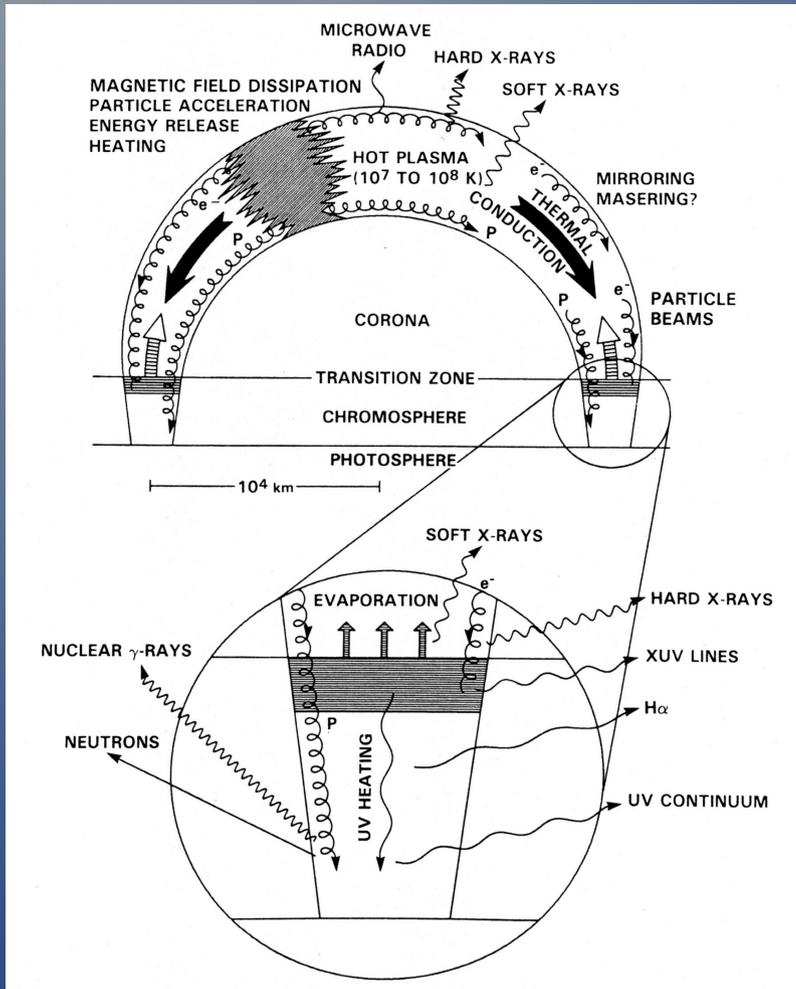


Schematic of GOES satellite

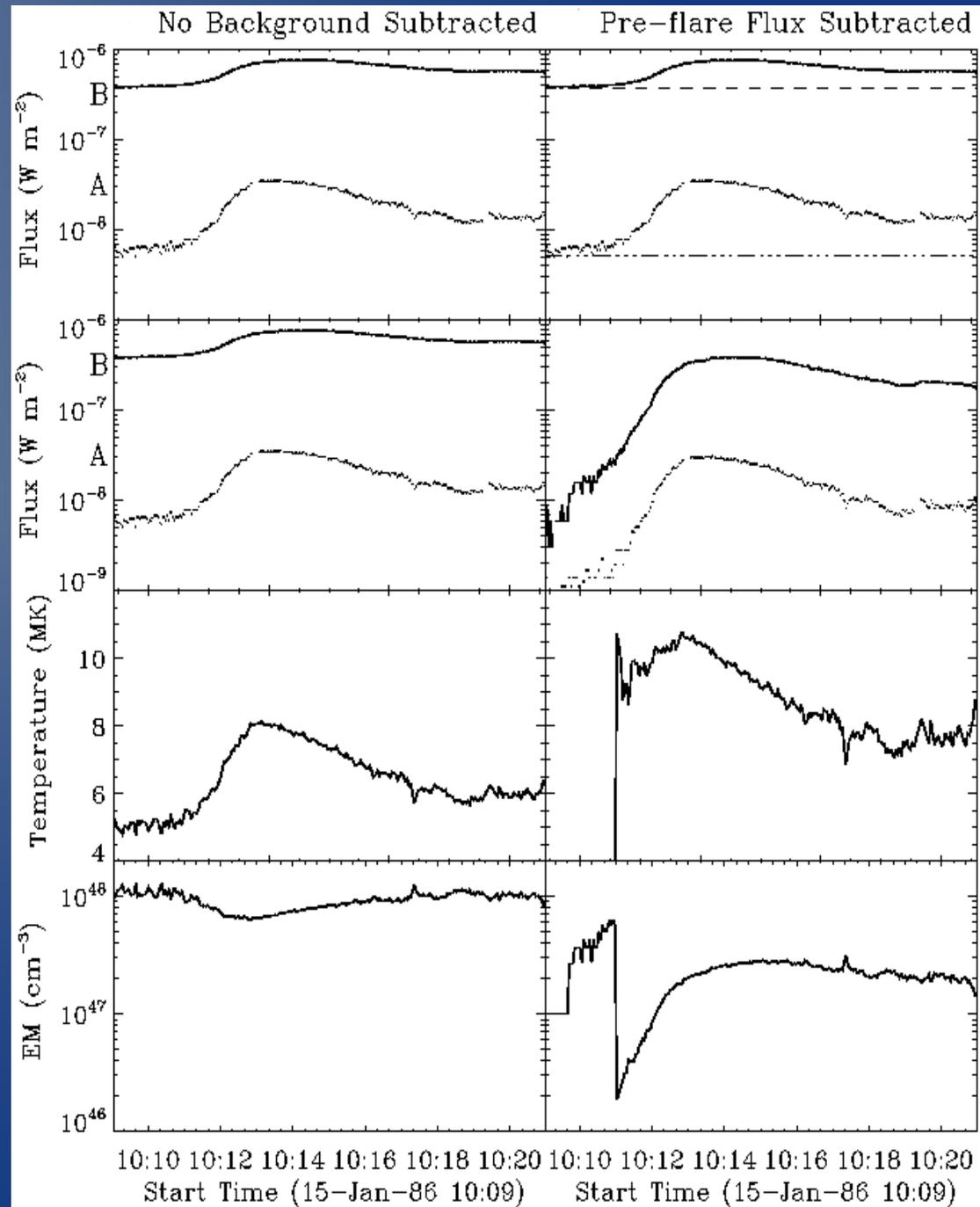
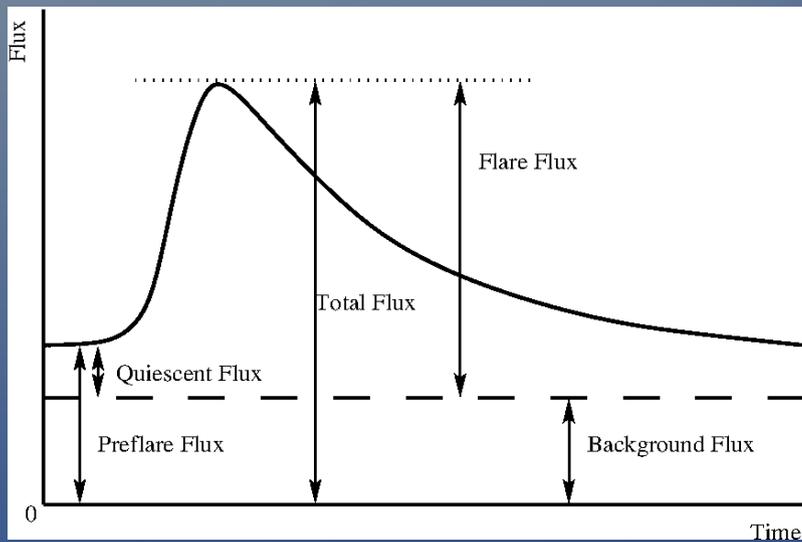
Solar Flares & GOES Observations



Solar Flares & GOES Observations

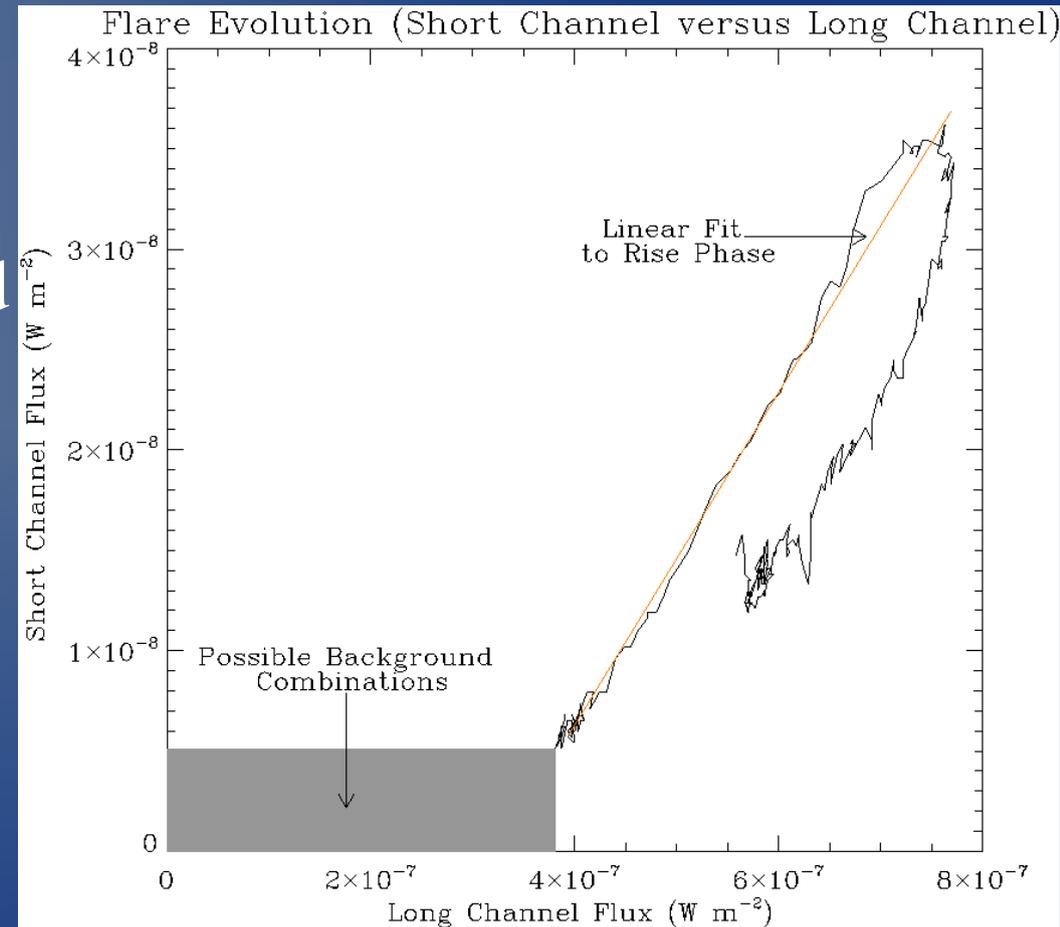


The GOES Background Issue



Temperature and Emission measure-Based Background Subtraction (TEBBS)

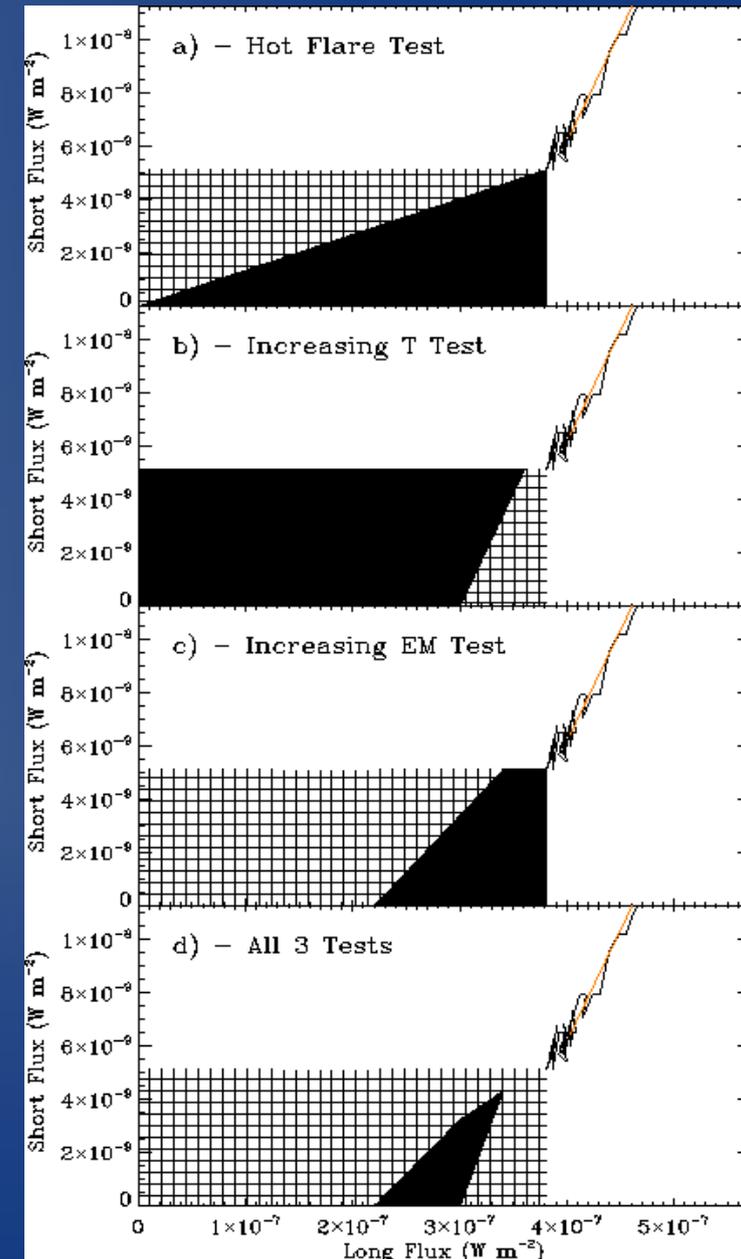
- Developed from method of Bornmann (1990)
- Any background subtraction has two components, Long and Short, (F_L^B , F_S^B).
- Each component lies somewhere between zero and pre-flare level in that channel \Rightarrow 2D sample space.
- Assumption: Background Subtraction must preserve expected T and EM behaviour.

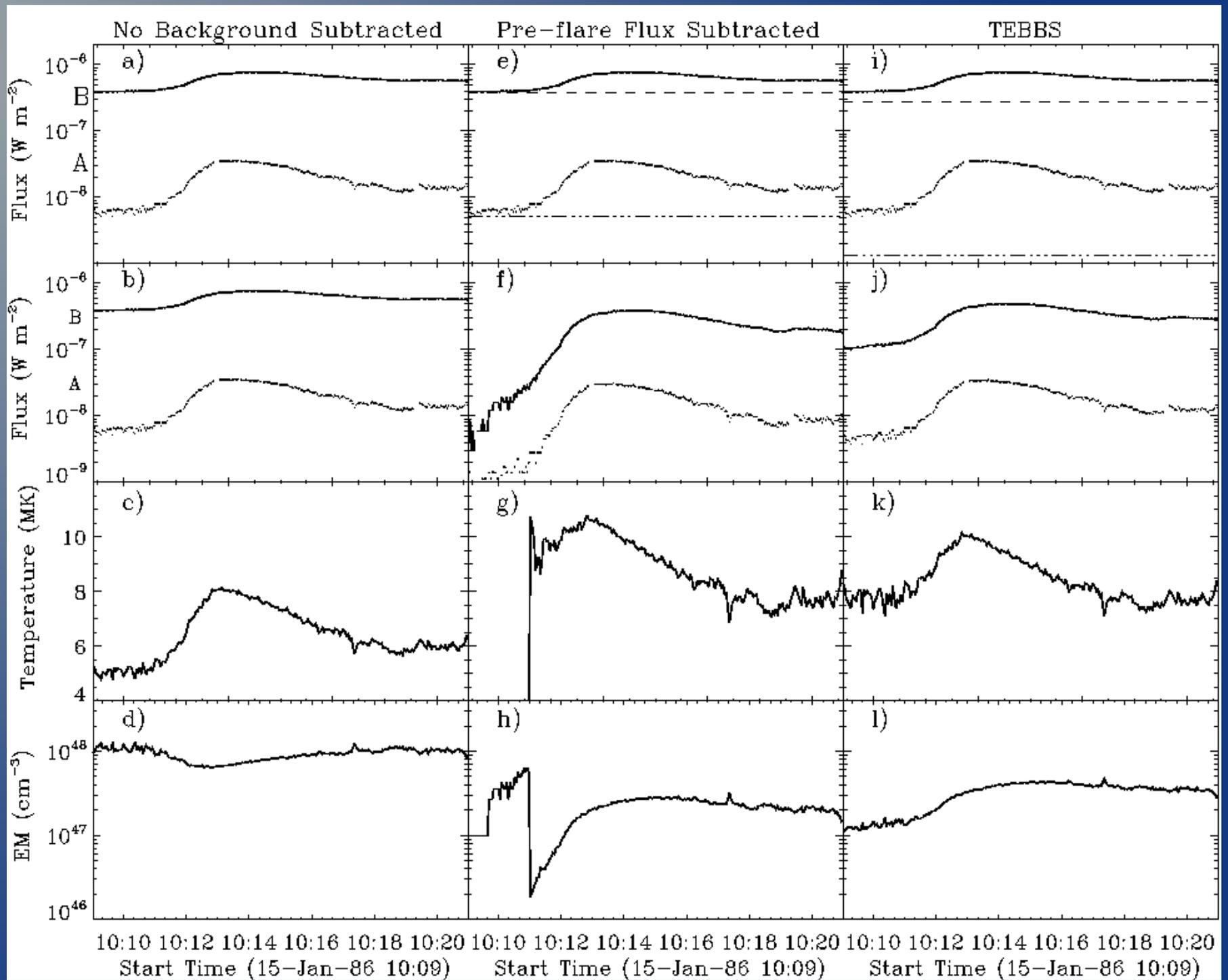


Ryan et al. (2011) Submitted

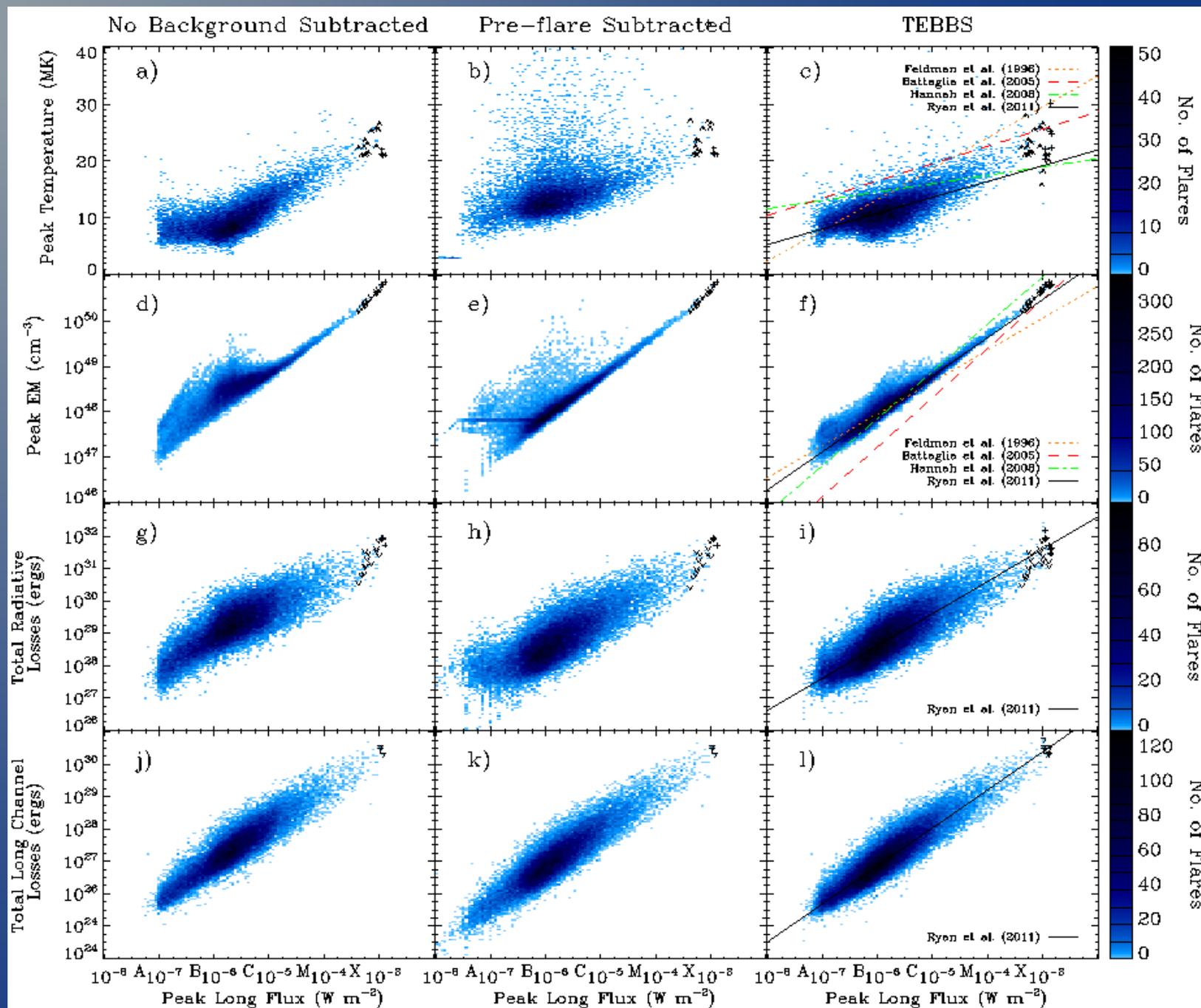
The Background Tests

- Uses three tests to ensure T and EM behaviour of flares maintained by background subtraction.
- Hot Flare Test
 - Ensures flare T always above background T and instrumental T threshold (4 MK).
- Increasing Temperature Test
 - Ensures flare T increases throughout rise phase.
- Increasing Emission Measure Test
 - Ensures flare EM increases throughout rise phase.





Preliminary Results



Future Work

- Fit distributions of flare plasma parameters with more rigorous bayesian fitting routine and compare with previous studies.
- Perform statistical analysis on flare frequency and energy distributions.
- Calculate delay times between peaks in T and EM to investigate chromospheric evaporation.

Thank You

- Peter Gallagher, TCD
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- Richard Schwartz, NASA/GSFC
- Alex Young, NASA/GSFC
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- IRCSET

